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ILLUSTRATED GUIDE

and Descriptions of

Photographic Inter-Lens Shutters

with

Directions for Cleaning and Repairing



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by
William O. Hammer.

Foreword.

INTER-LENS shutters are so accurately constructed and assembled that they are not easily disarranged by ordinary operation, consequently extensive repairs are seldom required unless the operator is careless in handling or the instrument is grossly misused.

All delicate mechanisms need attention and readjusting periodically and photographic inter-lens shutters are no exception to the rule.

These repairs and attentions are not sufficiently serious to require in most cases the attention and skill of an expert, but with a slight knowledge of the operation, arrangement and construction of the various working parts such as may be acquired from reading the various descriptions in the following pages, any person of average intelligence, with the use of a few small tools, should be capable of adjusting and repairing any slight disarrangements which are liable to occur with ordinary usage.

Seventeen types of inter-lens shutters are described and illustrated in the present treatise by means of greatly enlarged photographs in order to render the operator more familiar with the construction and arrangement of these delicate mechanisms, so that needed minor repairs may be easily made.

This treatise will fully acquaint the amateur with the operation of most inter-lens shutters so that he will be capable of removing and cleaning the various parts, as well as finding and correcting minor troubles.

The information to be found in the following pages is of great use to the photographic dealer for the reason that the majority of all shutter repairs are slight ones and can be easily accomplished without referring the matter to an expert.

Most dealers are confident that they themselves can easily make the necessary repairs as well as an expert but with no knowledge of the mechanism, the result is an improperly assembled shutter which of course fails to operate. This necessitates the services of an expert which incurs expense as well as loss of time and the inconvenience of being without a camera, if not resulting in serious damage to some of the delicate parts.

This treatise is also intended to familiarize dealers and operators with the proper arrangement of the working parts so they will be able to recall the proper place of each individual part and thus properly re-assemble the device.

As the jeweler and watchmaker is already skilled in the repairing of delicate mechanisms and the adjustment of same, the information contained herein should render him capable of performing all necessary repairs on inter-lens shutters and thus provide a side line which should prove remunerative.



INTER-LENS shutters are of three types: automatic, setting, and a combination of both. The construction and design varies with different makes, but the working principle is always the same, that is, each shutter must give the correct "TIME," "BULB" and "INSTANTANEOUS" exposures.

Most shutters are provided with the Iris Diaphragm to adjust the shutter aperture, except in cases where the shutter blades operate to adjust the aperture. Shutters with three or more blades form a star-shaped or radial aperture, thus producing an even distribution of light over the entire plate in a shorter space of time than a shutter provided with two blades only.

The method of making an exposure or releasing the shutter is accomplished in one of three ways, by a finger release, cable release or piston and cylinder with rubber bulb attached.

On most shutters the speed exposures are adjustable, being controlled either by means of the spring, lever, gear or air pump, retarding device. The spring and lever retarding devices give accurate values from one twenty-fifth to one one-hundredth part of a second, while the gear and air pump retarding devices are more accurate and produce a speed value ranging from one second to one three-hundredth part of a second.

Of all the above mentioned release and retarding devices the pumps are the most delicate parts on the shutter and they cause the majority of all shutter troubles if not kept clean. They are made with the utmost care and accuracy and should be treated accordingly. The piston is accurately fitted within the cylinder and the entrance of fine particles of dust and also the tarnishing and corroding effect which salt water atmosphere would have upon the metal, will prevent a proper release or retarding motion.

— The pumps are attached either on the outside of the case or within the mechanism in order to render them as dust-proof as possible, but as there is no way of making them absolutely tight it is necessary to occasionally clean them.

— The shutter mechanism is accurately constructed and not easily disarranged by ordinary operation. The levers of the lower grade shutters are made of brass while those of the higher grades are either stamped from german silver or steel. The diaphragm and shutter segments are made of vulcanized rubber or steel.

Overhauling a shutter requires more patience than skill. Everything must be carefully studied before taking a shutter apart. The student must be familiar with every operation. Each part is fitted and operates freely, therefore it must come apart in the same way without forcing.

The necessary tools for the removal of the various parts are a set of watchmaker's screwdrivers and a pair of fine steel tweezers. Delicate parts must be handled with the tweezers and not with the fingers. Make it a rule to use a screwdriver which corresponds in size with the screwhead. Press the screwdriver firmly into the slot and turn the screw with a slow, steady motion to prevent the screwdriver from slipping off the screw and injuring adjacent delicate parts.

Almost every type of shutter varies slightly in construction due to improvements made thereon, therefore the student may observe that the illustrations are slightly different in some minor details from the shutter on which he may be working. This will not, however, cause any great difficulty as the principle details are similar and it will be an easy matter to locate the relative positions of the various parts by referring to the illustrations.

In order to insure proper re-location of every part and to avoid confusion it is necessary to keep each lever with its screw and spring in a separate group away from similar groups and to arrange them as nearly as possible in the same relative position they occupy when assembled in the shutter. In the event of the parts becoming disarranged, the illustrations of the shutter interior should readily assist in their proper re-location. It is a good idea to procure a second-hand shutter in good order and practice on it by taking it apart and re-assembling it until the student is thoroughly familiar with the arrangement, operation and construction of each part.

→ When about to overhaul a shutter, first test the various exposures to find out which one does not work properly. For instance, if the "TIME" and "BULB" are in proper condition but the speeds are too slow or do not operate at all, the trouble will be in the retarding cylinder, which can readily be corrected by cleaning.

If the shutter does not act for either exposure, the trouble is likely to be found in the release pump. Clean same thoroughly and if the trouble is not overcome look elsewhere. It may be that the shutter at some previous time was re-assembled incorrectly or inadvertently some of the parts were not replaced. Compare your shutter mechanism with the illustrations and carefully check the parts and their relative location and especially the shape and arrangement of the springs, as a misshapen spring or one misplaced would prevent the shutter from working properly.

Should some of the parts be missing or badly bent, it is advisable to send to the maker or a shutter expert to have the parts renewed as this requires more skill and experience than the ordinary operator possesses. It is advisable to have duplicate levers, springs and shutter or diaphragm blades on hand in order to avoid delay.

In the beginning it is better for the student to limit his operations to cleaning only, and not attempt any repairs until he is thoroughly familiar with the parts and their arrangement. No difficult repairs should be attempted until sufficient skill has been acquired through experience with minor ones.

Through constant practice he will acquire skill and experience and thus in time become able to make repairs with great speed and accuracy. An accurate and rapid shutter repairer will find the work not only interesting and fascinating, but likewise remunerative.

As far as possible the same reference numerals are used to indicate the same or corresponding parts of the shutter in the illustrations.

Rules for Overhauling Inter-Lens Shutters

1. Remove the shutter from the camera.
2. Screw out front and back lenses.
3. Carefully remove all parts obstructing the mechanism to be cleaned, adjusted or repaired.
4. Carefully remove the pumps consisting of cylinders and their pistons.
5. To overhaul the mechanism: Operate the shutter and diaphragm blades. If they operate freely and easily, merely blow out dust or any other foreign matter. If they do not operate freely, remove the operating parts and clean them carefully, taking care not to bend or alter them, as it will prevent the proper operation of the shutter if the distance between the working centers of the levers is altered. Before loosening screws, carefully remove the springs with a pair of tweezers. In order to clean the lever bearings, make a slightly tapered wooden stick and insert with a rotating motion.
6. Re-assembling: Replace all of the parts carefully in the reverse order in which they were removed, taking care to check location and arrangement with the illustrations. Do not interchange screws and springs.
7. Cleaning the pumps (pistons and cylinders): Make a tissue paper swab on the end of a light wooden stick, apply a drop of benzine on the swab and carefully clean the inside of the cylinder with a rotating motion. Also clean the piston with tissue paper and when replacing same care should be taken to avoid finger marks. Do not lubricate the piston with any kind of oil as this is liable to gum and gather dust which will prevent same from operating properly. The piston must slide freely and smoothly within the cylinder. If it does not do so, remove it and repeat the cleaning operation on both cylinder and piston until all tarnish and foreign matter have been entirely removed. Emery, sand paper or ANY OTHER ABRASIVE MATERIAL SHOULD NOT BE USED as this will destroy the accurate fit of the piston within the cylinder.
8. Re-assemble the shutter carefully after all the parts have been thoroughly cleaned.
9. Test the shutter several times by operating on various indicated exposures.
10. Carefully clean the lenses on both sides with a piece of soft clean linen or lens paper, taking care to remove any lint or dust with a camelhair brush before screwing back into the shutter.
11. Attach the shutter to the camera.
12. Test the various operations of the shutter several times to be sure that everything is in proper working relation.

Compound Shutter

TYPE:—Combination Automatic and Setting Shutter.
Made in Seven Sizes.

Distributors: Bausch & Lomb Optical Co.
Rochester, N. Y.

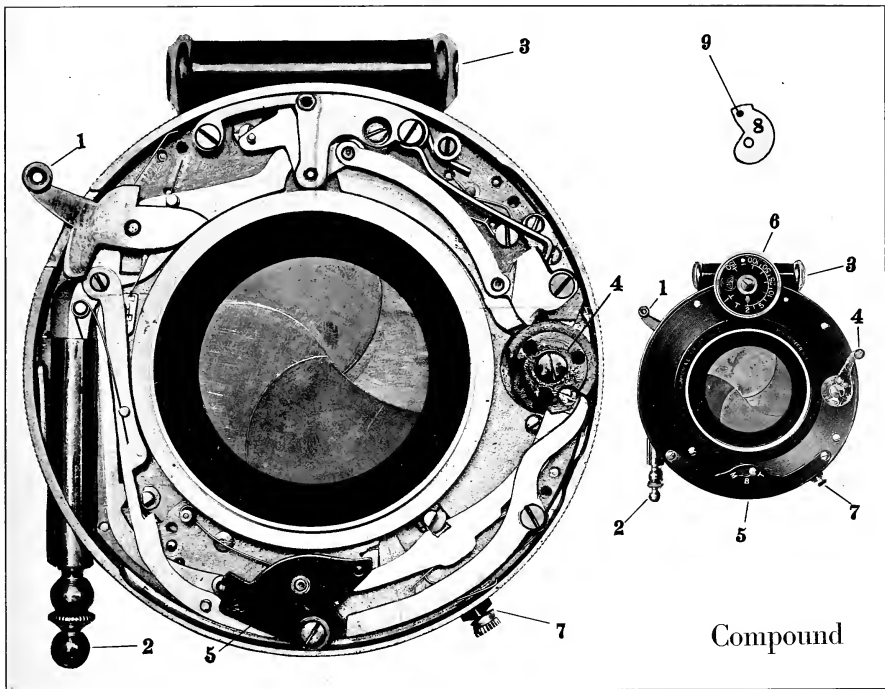
Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
3. Retarding Pump.
4. Setting Lever for Motor Spring 4.
5. Exposure Indicator: T (Time); B (Bulb); M (Instantaneous).
6. Speed Setting Dial.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Adjusting Cam Under Speed Setting Dial. (No. 6).
9. Pin to operatively connect cam 8 with Speed Dial 6.

TO SEPARATE:—Remove Speed Setting Dial 6, Setting Lever 4 and Front Cover Plate which is held with four screws. To reach shutter and diaphragm blades remove lever 1, pumps 2 and 3 and lift out carefully mechanism plate which is also held by four screws to the back plate.

NOTE:—Adjusting cam 8 should be replaced in the position shown, with the pin 9 properly engaging hole in speed dial 6. In some types the pin 9 is secured to the speed dial and the hole is then located in the cam 8.

If necessary the ends of the retarding pump 3 may be unscrewed by means of a pair of pliers having corrugated jaws.



Compound

Volute Shutter

TYPE:—Setting Shutter. Made in Three Sizes.

Manufactured by Bausch & Lomb Optical Co.
Rochester, N. Y.

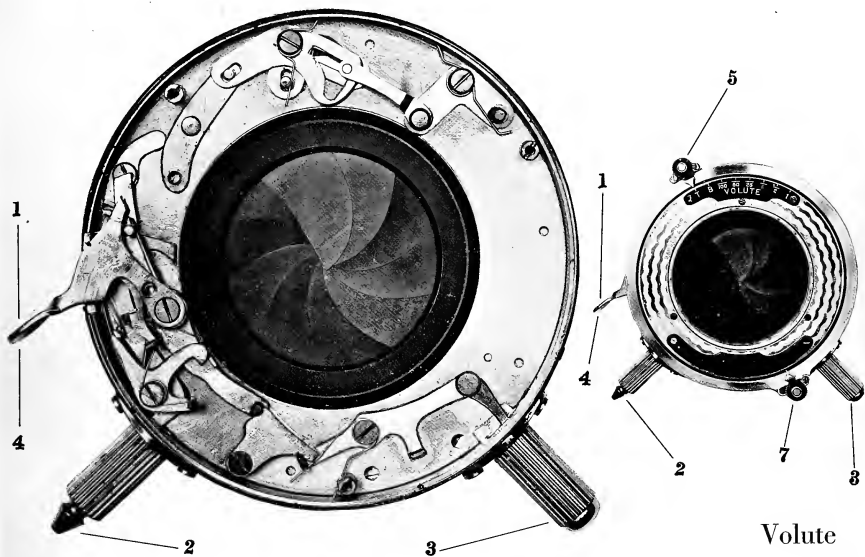
Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
3. Retarding Pump.
4. Setting Lever.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating size of Diaphragm Aperture.

NOTE:—In this type the shutter blades also serve as a diaphragm. The size of the diaphragm aperture is adjusted by limiting the opening of the shutter blades by means of the lever 7. The setting and releasing action is accomplished by one lever.

TO SEPARATE:—Remove front cover which is held by means of three screws. Next remove cam ring to which lever 7 is secured and second cam ring to which exposure indicator 5 is attached. This will uncover a third ring held in place by three screws and retaining the lens mountings. Remove this ring and the remaining parts will be readily accessible. Do not remove the shutter mechanism plate as the shutter blades are accurately centered on the back of said plate. Should they be in need of repairs or not operating freely, it is advisable to send the shutter to the maker or an expert as replacing the shutter blades in this type involves a very delicate and skillful operation.

Before removing the cam rings observe their relative positions and the way they engage the operating levers in order to insure proper relocation. Before replacing same lubricate both sides with vaseline after cleaning.



Xexcell Shutter

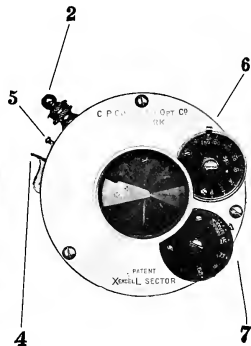
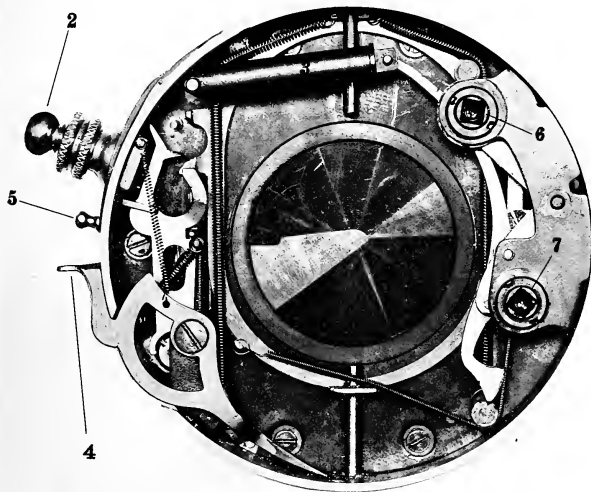
TYPE:—Setting Shutter. Made in Six Sizes.

Manufactured by C. P. Goerz American Optical Co.
217 East 34th Street, New York, N. Y.

NOTE:—In this type the shutter blades also serve as a diaphragm, the size of the aperture being obtained by limiting the opening of the shutter blades by means of the lever 7.

Specification and Index to Opposite Page.

2. Pump or Bulb Release. By screwing off the knurled cap of the pump, shutter can be released with the finger.
 3. Retarding Pump.
 4. Setting Lever.
 5. Exposure Indicator for the "TIME" and "INSTANTANEOUS."
 6. Speed Indicator and Inner Lever Adjusting Mechanism.
 7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
- TO SEPARATE:—Remove indicators 6 and 7 and the front cover which is held by three screws.



Xexcell

Optimo Shutter

TYPE:—Setting Shutter. Made in Six Sizes.

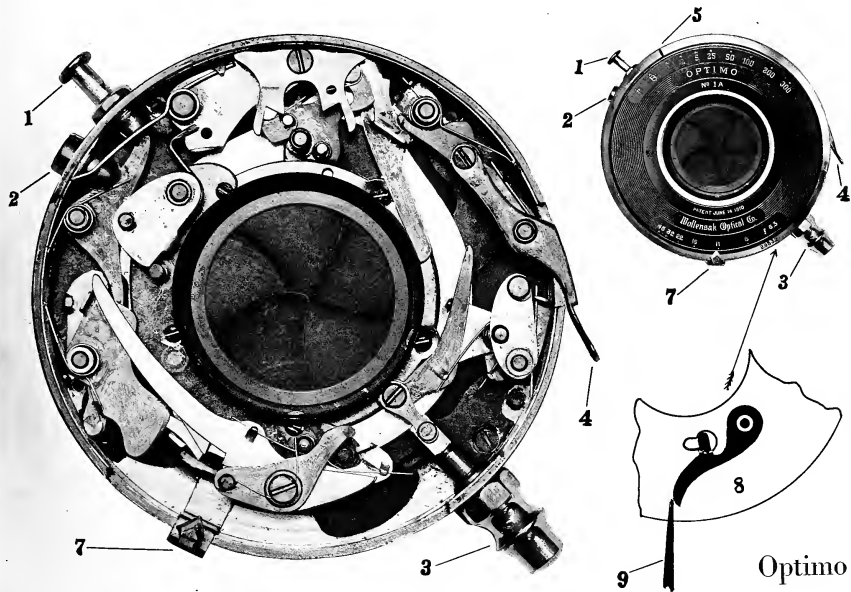
Manufactured by Wollensak Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Cable Release Sleeve.
3. Retarding Pump.
4. Setting Lever.
5. Indicator Disc for Adjusting Exposures.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Pawl to Secure Cover.
9. Pin to Release Pawl.

TO SEPARATE:—To remove front cover insert a pin 9 through slot of diaphragm adjusting lever 7 in the direction indicated by the arrow to release pawl 8. Push pawl 8 as far as it will go. Grasp shutter with both hands and turn front cover to the left and lift off. Remove indicator disc 5 and second cover which retains the lens mounting and which is held in position by means of four screws.

NOTE:—Before removing disc 5 observe its position and the manner in which it engages the operating levers in order to insure proper re-location. Before replacing same lubricate both sides with vaseline after cleaning.



Multispeed Shutter

TYPE:—Setting Shutter.

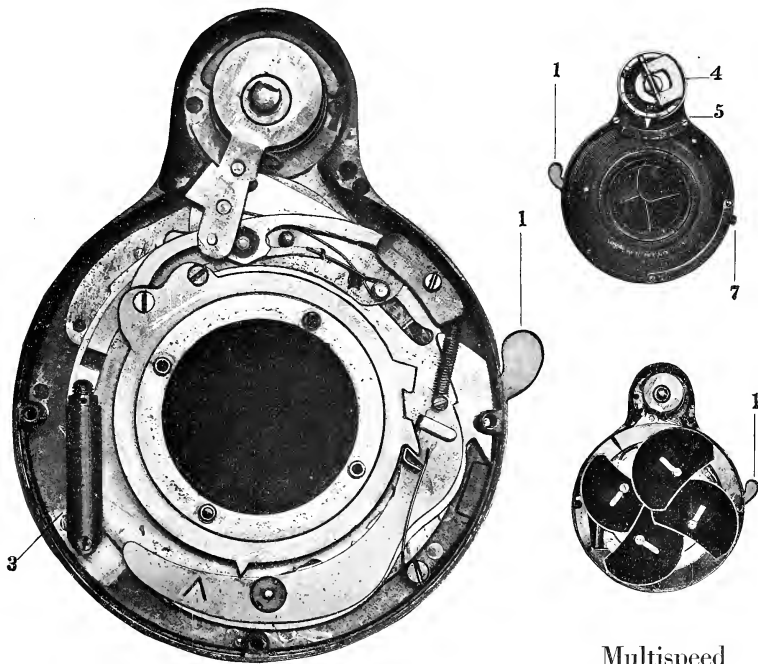
Manufactured by Multi Speed Shutter Co.
Morris Park, Long Island, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
3. Retarding Pump.
4. Setting Key.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove back cover plate which is held by five screws and one nut.

NOTE:—Small interior view discloses the arrangement and relative positions of shutter blades.



Multispeed

Ernemann Shutter

TYPE:—Combination Automatic and Setting Shutter.

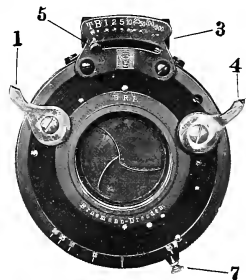
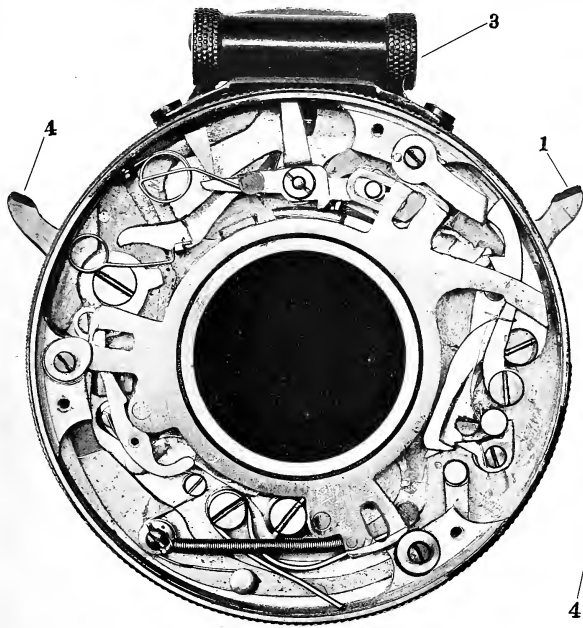
Distributors: Ernemann Photo-Kino Works, Inc.,
470 Fourth Avenue, New York, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
3. Retarding Pump.
4. Setting Lever.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove back cover plate which is held in position by means of three screws.

NOTE:—Small interior illustration discloses arrangement and relative location of the shutter blades.



Ernemann

Koilos Shutter

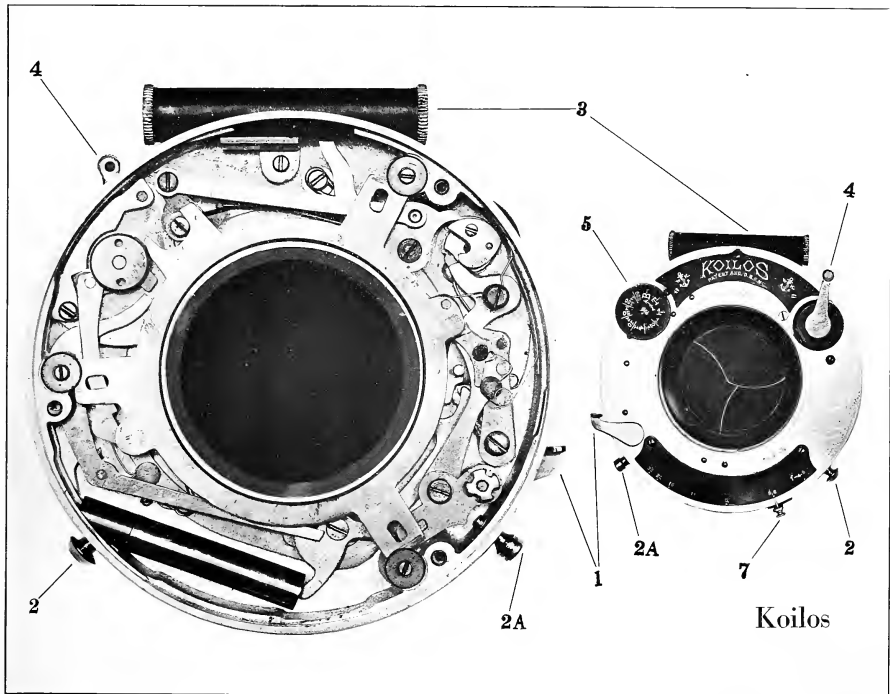
TYPE:—Combination Automatic and Setting Shutter.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
- 2A. Cable Release Sleeve.
3. Retarding Pump.
4. Setting Lever.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove the back cover plate which is secured in position by means of three screws.

NOTE:—The arrangement of the shutter blades in this type is similar to that of the Ernemann type.



Koilos

Regno Shutter

TYPE:—Setting Shutter. Made in Four Sizes.

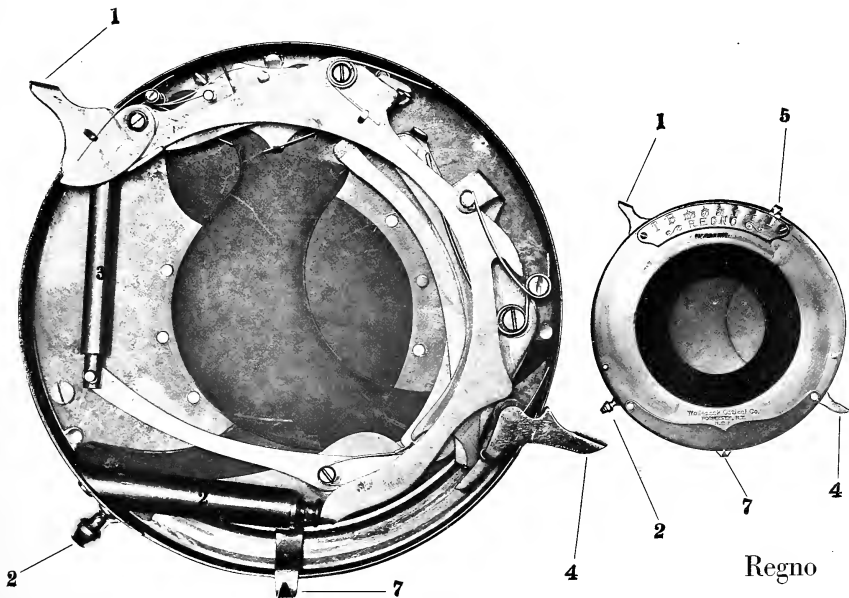
Manufactured by the Wollensak Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
3. Retarding Pump.
4. Setting Lever.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove front cover by taking out three screws from the back of the shutter case.

NOTE:—Before replacing cover set indicator 5 on "T" to properly engage operating levers.



Regno

Automat Shutter

TYPE:—Automatic.

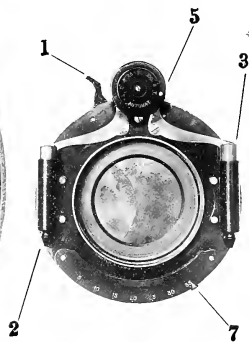
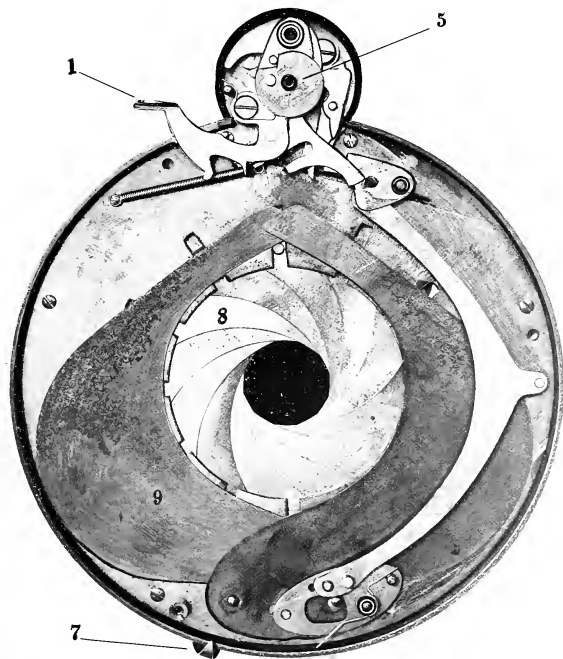
Manufactured by Bausch & Lomb Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
3. Retarding Pump.
5. Exposure Indicator Disc and Adjusting Cam.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Iris Diaphragm Leaves.
9. Shutter Blades.

TO SEPARATE:—Remove dial and disc 5, diaphragm scale and front cover, the latter being held by means of three screws.

NOTE:—Before removing indicator disc 5 and cams underneath observe their relative positions in order to insure proper re-location.



Automat

E. K. Automatic Shutter

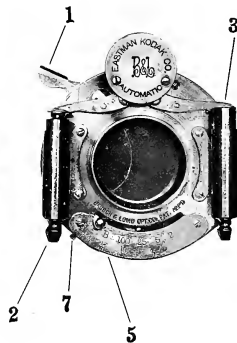
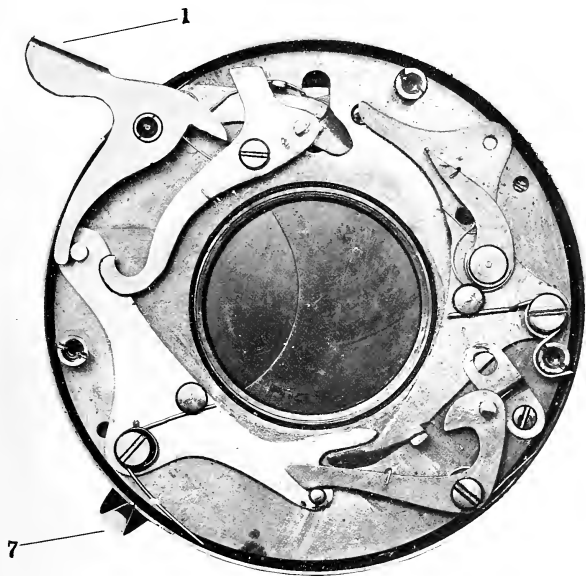
TYPE:—Automatic.

Manufactured by Bausch & Lomb Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
3. Retarding Pump.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove pumps 2 and 3 and the front cover which is held in position by three screws.



E. K. Automatic

F. P. K. Automatic Shutter

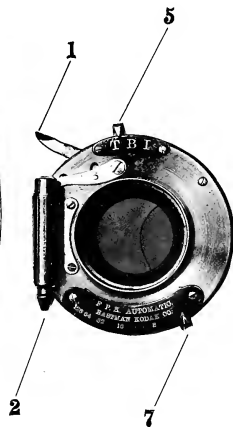
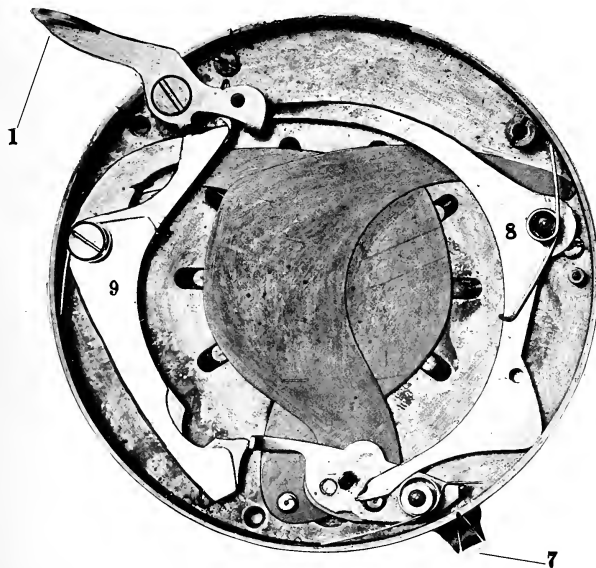
TYPE:—Automatic.

Manufactured by Bausch & Lomb Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump or Bulb Release.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Shutter Blades Operating Lever.
9. Operating Levers for BULB and TIME Exposure.

To SEPARATE:—Remove pump 2, Iris Diaphragm Scale and front cover, which is held in position by means of three screws.



F. P. K. Automatic

Ingento Junior Shutter

TYPE:—Automatic Shutter.

Manufactured by Ilex Optical Co.
Rochester, N. Y.

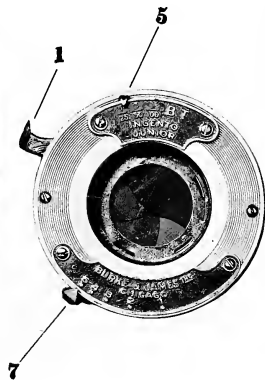
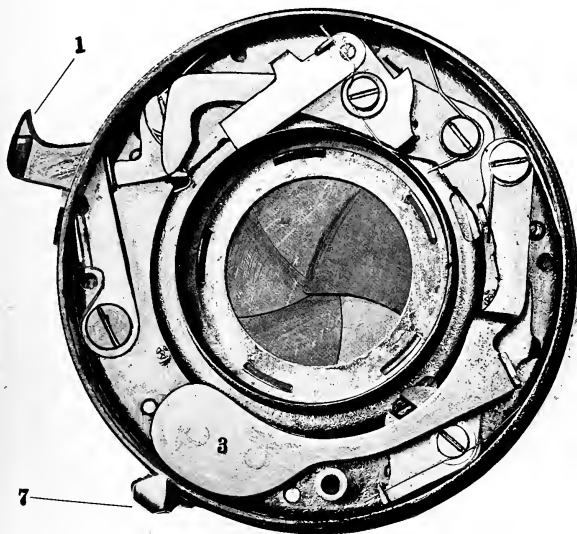
Distributors: Burke & James, Inc., Chicago, Ill.

Specification and Index to Opposite Page.

1. Finger Release.
3. Lever Retarding Device.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Shutter Blades Operating Lever.

TO SEPARATE:—Remove front cover which is held by two screws.

NOTE:—This shutter is similar in construction and operation to the Ilex Marvel.



Ingento Junior

Kodak Ball Bearing Shutter

TYPE:—Automatic Shutter.

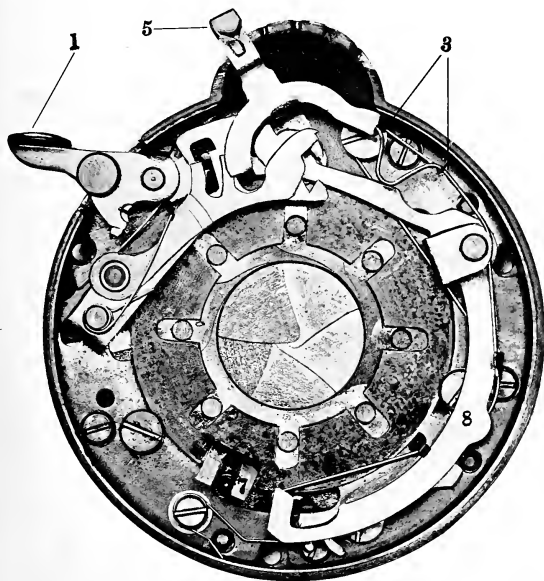
Manufactured by Eastman Kodak Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
3. Spring Retarding Device.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Shutter Blades Operating Lever.

TO SEPARATE:—Remove front cover which is held by means of three screws from the back shutter plate.

NOTE:—By turning the indicator 5 to the right the tension of the spring 3 is increased to impart greater rapidity to the operating lever 8. The front cover must be carefully replaced to properly connect with the shoulder 7 inside the shutter case.



Kodak Ball Bearing

Ingento No. O Shutter

TYPE:—Automatic Shutter.

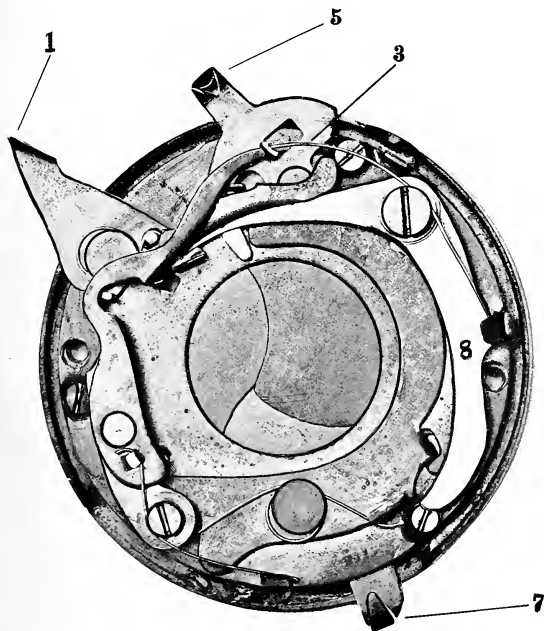
Distributors: Burke & James Inc.
Chicago, Ill.

Specification and Index to Opposite Page.

1. Finger Release.
3. Spring Retarding Device.
5. Exposure Indicator.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.
8. Shutter Blades Operating Lever.

TO SEPARATE:—Remove front cover which is held by means of two screws.

NOTE:—By moving the Exposure Indicator to the right the tension of the spring 3 is increased to impart greater rapidity to the operating lever 8.



Ingento No. 0

Ilex Acme Shutter

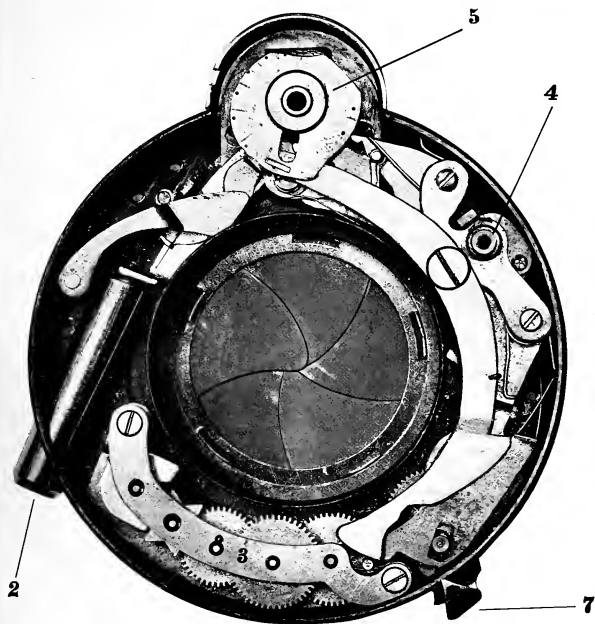
TYPE:—Setting Shutter.

Manufactured by Ilex Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

- 1 Finger Release.
- 2 Pump Release.
- 3 Gear Retarding Device.
- 4 Setting Lever and Standard therefor.
- 5 Exposure Indicator and Interior Adjusting Cam.
- 7 Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove levers 1 and 4, indicator and dial 5, and front cover which is held in position by two screws.



Pflex Acme

Compur Shutter

TYPE:—Combination Automatic and Setting Shutter.

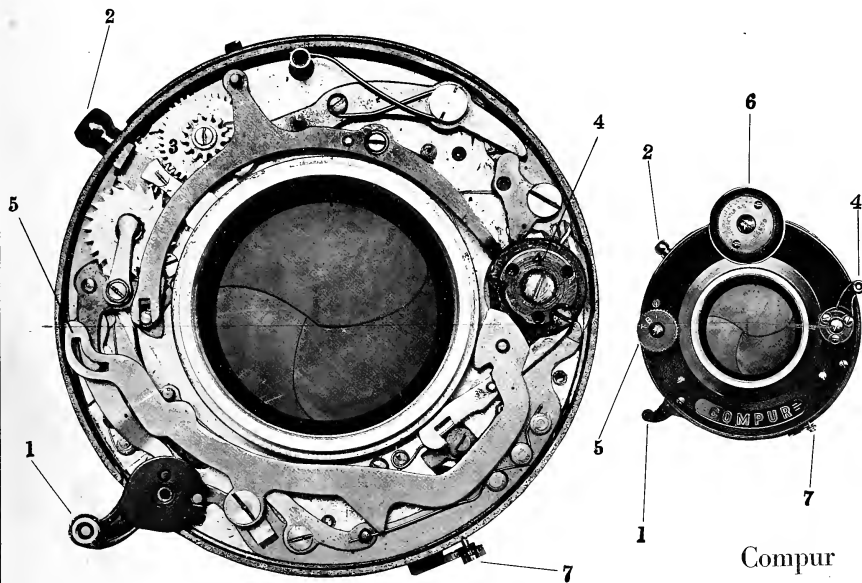
Distributors: Bausch & Lomb Optical Co.
Rochester, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Cable Release Sleeve.
3. Gear Retarding Device.
4. Setting Lever for Motor Spring 4.
5. Exposure Indicator and Adjusting Lever.
6. Speed Indicating Dial.
7. Lever for Adjusting and Indicating Size of Diaphragm Aperture.

TO SEPARATE:—Remove speed dial 6, lever 4 and front cover, which is secured by means of two screws. To reach the shutter and diaphragm blades remove finger release 1 and lift out mechanism plate which is held to the back plate by means of four screws.

NOTE:—Before removing adjusting cams under speed dial 6 observe their relative positions in order to insure proper re-location.



Compur

Tenax Shutter

TYPE :—Combination Automatic and Setting Shutter.

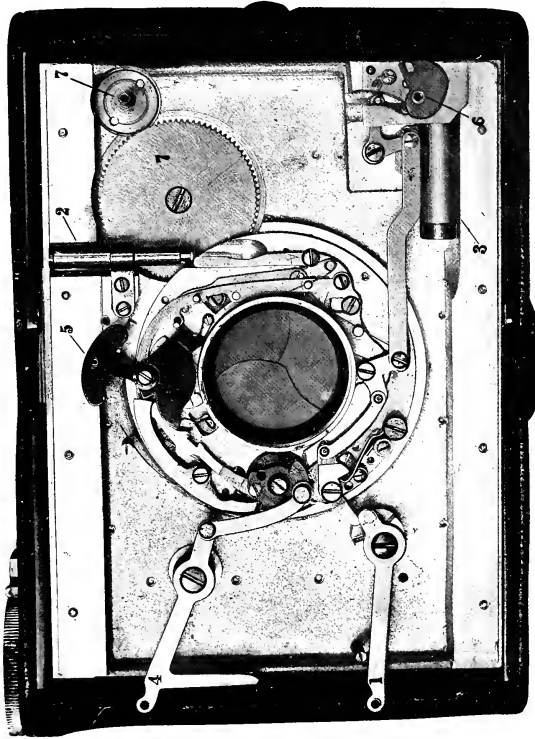
Manufactured by C. P. Goerz American Optical Co.
317 East 34th Street, New York, N. Y.

Specification and Index to Opposite Page.

1. Finger Release.
2. Pump Release.
3. Retarding Pump.
4. Setting Lever.
5. Exposure Indicator.
6. Speed Indicator Dial and Interior Adjusting Cam.
7. Dial for Adjusting and Indicating Size of Diaphragm Aperture.

TO SERIVATE:—Screw out front lens, remove speed indicator dial 6, aperture indicating dial 7 and front cover which is held in position by four screws, two on each end.

NOTE:—When removing dials 6 and 7 observe their relative connections in order to insure proper re-location.



TENAX

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